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AUTHOR Guerrero, Frank; Stevens, Joy
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ABSTRACT

The Chapter 1 Corrective Mathematics program provided supplementary, individualized instruction in mathematics using both face-to-face instruction and computer-assisted instruction (CAI) for eligible students attending nonpublic schools in New York City. The objective for the 1988-89 Corrective Mathematics Program was that students would achieve statistically significant mean gains in normal curve equivalents (NCEs) on standardized tests. This document provides the findings of this evaluation based on data from document reviews, analyses of mean gains on standardized test scores, site visits, interviews with program teachers, and analyses of the CAI teacher survey given to 20 CAI teachers. The following items are included: (1) a brief introduction to the program and the program evaluation; (2) a program description; (3) a discussion of the program implementation; (4) the results of the CAI teacher survey; (5) a summary of student outcomes; and (6) conclusions and recommendations. Appendices include a description of the Chapter 1 Nonpublic School Reimbursable Services, 1988-89; and a copy of the Computer Assisted Instruction Teacher Survey. (KR)

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OREA Report

EVALUATION SECTION REPORT

CHAPTER 1
CORRECTIVE MATHEMATICS PROGRAM
1988-89

SE051647

EVALUATION SECTION REPORT

John Schoener, Chief Administrator

May 1990

EVALUATION SECTION REPORT

CHAPTER 1
CORRECTIVE MATHEMATICS PROGRAM
1988-89

Prepared by
The OREA Instructional Support Evaluation Unit

Frank Guerrero, Unit Manager
Joy Stevens, Evaluation Specialist

New York City Board of Education
Office of Research, Evaluation, and Assessment
Robert Tobias, Director

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CHAPTER 1 CORRECTIVE MATHEMATICS PROGRAM

EVALUATION SUMMARY, 1988-89

BACKGROUND

The Chapter 1 Corrective Mathematics program provided supplementary, individualized instruction in mathematics to 5,806 eligible students attending 130 nonpublic schools in New York City. The total included 3,689 students receiving face-to-face instruction and 2,117 students receiving computer-assisted instruction (C.A.I.). Seventy-one percent of the students participated in the program in 1988-89 for the first time, and 23 percent were in their second year. Almost six percent had participated in the program for three years or longer.

Due to the 1985 Supreme Court decision that instruction by public school teachers on the premises of nonpublic schools was unconstitutional, alternative methods for providing Chapter 1 services were devised. Of the 130 schools which participated in the Corrective Mathematics program,

- fifty-three received services at mobile instructional units, which are mobile classrooms parked outside the school being served;
- nineteen received services in designated classrooms in nearby public schools;
- ten received services in leased neutral sites;
- two received services at nondenominational schools; and
- forty-six received C.A.I.

Program staff included a coordinator, two field supervisors, and 70 Corrective Mathematics program teachers. Program teachers provided instruction to small groups of students one to five times per week for the entire school year. The length of the sessions ranged from 45 to 60 minutes. More than 85 percent of the students received at least two sessions of remedial instruction per week. Funding totaled more than $5.3 million.

PROGRAM OBJECTIVES

The objective for the 1988-89 Corrective Mathematics Program was that students would achieve statistically significant mean gains in normal curve equivalents (N.C.E.s) on standardized tests.

EVALUATION METHODOLOGY

The findings of this evaluation are based on data from document reviews, analyses of mean gains in standardized test scores, site visits, interviews with program teachers, and analyses of a C.A.I. teacher survey given to all 20 C.A.I. teachers.

FINDINGS

Face-to-Face Instruction

Program Implementation. Site observations, review of program documents and staff interviews all indicate that the Corrective Mathematics program was implemented as proposed.

- A Parental Involvement program was in place, which provided materials and take-home kits to 2,781 parents, and which conducted 43 workshops in the course of the school year.

- The staff development program offered multifaceted training on a wide variety of topics. The Chapter 1 teachers utilized a rich repertoire of teaching strategies derived from staff development.

Student Achievement. Except for grades ten and 12, where small numbers of students did not allow for the computation of statistical significance, the students in all grades achieved statistically significant mean gains on all tests, and thus met the program's criterion for success. Student achievement in 1988-89 was consistent with students' gains for the past five years.

Computer Assisted Instruction

In order to comply with the Supreme Court's 1985 ruling, Chapter 1 teachers are not present in the nonpublic school computer labs. Instead, they monitor instruction via modems from the Board of Education's administrative center. Trained non-instructional technicians are present in the computer labs to operate and maintain the equipment, and ensure order and safety.

Site observations, review of program documents, and staff interviews indicated the necessity of adapting instructional software to settings where a teacher is not physically present. Observations and interviews also indicated that Chapter 1 teachers must become expert users of the C.A.I. systems for remediation at a distance to be effective.

C.A.I. students received instruction via five different software packages: WICAT, CCC, ESC, and CNS for students in grades two through eight; and CCC and PLATO for students in grades nine through twelve. The majority of these students

received C.A.I.-only instruction, and about one fifth of them received combination services. In this second mode of instruction, the students received C.A.I. twice a week and face-to-face instruction once a week. Combination services were received in grades two through eight by students using ESC and WICAT, and in grades nine through twelve by students using PLATO.

Student Achievement. There were not enough students in grade 12 to compute statistical significance. The mean gain for student in grade 11 did not reach statistical significance. With these exceptions,

- The mean gains for all C.A.I. students combined, in both modes of instruction, were statistically significant on all tests, thus meeting the program's criterion for success.

When the mean gains were contrasted for students receiving face-to-face instruction, combination services, and C.A.I.-only instruction, analyses of variance with Scheffe post-hocs revealed that:

- The mean gains for students receiving face-to-face instruction were statistically significantly higher than the mean gains for students receiving C.A.I.-only. However, the mean gains for students receiving combination services were equal to those of students in face-to-face instruction.

RECOMMENDATIONS

Based on the information and analyses presented in this report, the following recommendations are made:

Face-to-Face Instruction

- Since program objectives were met by all grades on all tests, staff development and classroom instruction should continue as currently organized.

- Ways of expanding the Parental Involvement program should be explored. Perhaps a newsletter distributed to parents periodically could include parent-child mathematics activities.

Computer-Assisted Instruction

- The achievement of students who received combination services was significantly greater than the achievement of students receiving C.A.I.-only. Provided these results hold up for another year, an effort should be made to expand combination services whenever feasible.

- Efforts should continue to adapt the instructional software for use in settings where a teacher is not physically present. As part of this effort, software companies should be evaluated for their receptivity to input from the Chapter 1 teachers.

- In the interest of helping teachers acquire the necessary expertise with the C.A.I. systems, software companies should adjust their trainers' schedules to accommodate teachers who spend several days a week in the field.

- C.A.I. staff developers should include sufficient time for previewing lessons and helping teachers gain familiarity with lesson contents.

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I. INTRODUCTION

PROGRAM PURPOSE

The Chapter 1 Corrective Mathematics program provides supplementary mathematics instruction to eligible students in nonpublic schools in New York City. The major goals of the program are to deepen students' understanding of mathematical concepts, to improve their ability to perform computations and solve problems, and to assist them in applying this knowledge and three skills to everyday life. Secondary goals include enhancing students' self-esteem and helping them to develop a positive attitude toward mathematics.

ELIGIBILITY

Students are eligible for Chapter 1 services if they live in a targeted attendance area and score below a designated cut-off point on state-mandated or standardized reading tests. When all the students who had met the criteria were placed at a designated site, the program served additional students who met the residency and mathematics requirements but did not score below the designated cut-off point on the reading test. In addition, the Chapter 1 Evaluation Reporting System specifies that eligible students may be selected for Chapter 1 programs on the basis of classroom performance, teacher judgement, and achievement test data.

The nonpublic schools' annual testing program is used for preliminary screening for Chapter 1 eligibility. The majority of the schools use either the Scott-Foresman Test or the

Comprehensive Test of Basic Skills (C.T.B.S.). Students were eligible for Chapter 1 services if they scored at or below a specific grade equivalent on the annual standardized tests.*

The cut-off point for program eligibility ranged from three months below grade level for students in the first grade to two or more years below grade level for students in high school.

STUDENTS SERVED

During the 1988-89 school year, the Corrective Mathematics program served 5,806 Chapter 1-eligible students attending 130 nonpublic schools in New York City. The total includes 3,689 students receiving face-to-face only instruction and 2,117 students receiving computer assisted instruction. The largest numbers of students, nearly four fifths, were in grades two through six. More than a third of the students were in the third and fourth grades. Fewer than 100 first grade students participated in the "readiness" component of the program (see Table 1). Nearly three quarters of the students participated in the program for the first time in 1988-89, and almost one fourth were in their second year. Almost six percent had participated

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* The grade equivalent is a calculation of the grade placement, in years and months, of students for whom a certain score is typical. It represents the level of work a student is capable of doing. However, a ninthgrade student who achieves a test score that is 11.6 grade equivalents does not belong in the eleventh grade; rather, the 11.6 grade equivalent score indicates that the student scored as well as a typical eleventh grader would have scored on the ninth grade test.

TABLE 1

Student Participation in the Corrective Mathematics Program by Grade and Number of Years in the Program, 1988-89[a]

Grade	N[b]	%	Number of Years in the Program					
			1		2		3	
			N	%	N	%	N	%
1	96	1.6	96	100.0	0	0.0	0	0.0
2	910	15.7	842	92.5	64	7.0	4	0.4
3	1,080	18.6	761	70.5	308	28.5	11	1.0
4	1,036	17.9	636	61.4	318	30.7	82	7.9
5	855	14.7	503	58.8	256	29.9	96	11.2
6	721	12.4	469	65.0	197	27.3	55	7.7
7	434	7.5	280	64.5	110	25.3	44	10.2
8	238	4.2	147	61.8	59	24.8	32	13.4
9	214	3.7	212	99.1	2	0.9	0	0.0
10	152	2.6	131	86.2	21	13.8	0	0.0
11	45	0.8	27	60.0	15	33.3	3	6.7
12	16	0.3	11	68.8	5	31.2	0	0.0
Total	5,797		4,115		1,355		327	
Percentage		(100%)		(70.9%)		(23.4%)		(5.7%)

[a] Nine students, all of them first year C.A.I. participants, were ungraded and are not included in these data, making a total of 5,806 students.

[b] Totals include 3,689 non-C.A.I. and 2,117 C.A.I. students.

- Nearly three quarters of the students participated in the program for the first time in 1988-89.
- Nearly one quarter of the students have participated in the program for two years.
- The largest numbers of students, nearly four fifths, were in grades two through six.
- More than a third of the students were in the third and fourth grades.

in the program for three years or longer. Each year the program serves students new to elementary school and high school. All first graders and about nine tenths of the second graders were new to the program; in addition, almost three quarters of the students in the third grade were new to the program. No ninth, tenth, or twelfth graders had participated in the program for more than two years.

Students in the Corrective Mathematics program with social or emotional problems that interfered with academic progress also received services through the Clinical and Guidance program. In 1988-89, 2,373 Corrective Mathematics students (41 percent) were referred for Clinical and Guidance services.

DELIVERY OF CHAPTER 1 SERVICES: LEGAL PARAMETERS

On July 1, 1985, the Supreme Court held that local educational agencies' most common method of serving Chapter 1-eligible children--instruction by public school teachers on the premises of nonpublic schools--was unconstitutional. As a result, alternative methods for providing Chapter 1 services were devised. Eligible students attending nonpublic schools now receive Chapter 1 services at mobile instructional units (M.I.U.s), public school sites, leased neutral sites*, nondenominational schools, and via computer assisted instruction (C.A.I.) in designated rooms in nonpublic schools.

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* Public school sites are designated classrooms in public schools; leased neutral sites are classrooms in public buildings such as community centers; mobile instructional units are mobile classrooms generally parked outside the school being served.

In order to comply with the Supreme Court ruling, Chapter 1 teachers are not present in the computer labs. Instead, they track student progress through the curriculum and assist the instructional process via modems from the Board of Education's administrative center. Trained non-instructional technicians are present in the computer labs with students to operate and maintain the equipment, and order to ensure safety.

In order to further comply with the Supreme Court ruling, the hardware and software utilized for Chapter 1 students must be non-divertible; that is, it cannot be utilized in the nonpublic schools for anything but the instruction of Chapter 1 students. The hardware/software configurations were put together with this in mind.

PROGRAM OBJECTIVES

As a result of the implementation of the 1988-89 Corrective Mathematics program, the following objectives were to be achieved:

- First grade students would achieve a statistically significant mean gain in normal curve equivalent units (N.C.E.s)* from pretest to posttest on the Total Mathematics score of the Stanford Early School Achievement Test (SESAT).
- Students in grades two through eight would achieve a statistically significant mean gain in N.C.E.s from pretest

*Normal Curve Equivalent scores are similar to percentile ranks but, unlike percent ranks, are based on an equal-interval scale. The N.C.E.s are based on a scale ranging from one to 99, with a mean of 50 and a standard deviation of approximately 21. Because N.C.E. scores are spaced equally, arithmetic and statistical calculations such as averages are meaningful. In addition, comparisons of N.C.E. scores may be made across different achievement tests.

to posttest on the Computation, Concepts, and Applications subtests and the Total Mathematics score of the Stanford Achievement Test (S.A.T.).

- Students in grades nine through twelve would achieve a statistically significant mean gain in N.C.E.s from pretest to posttest on the Total Mathematics score of the Stanford Test of Academic Skills (TASK).

PROGRAM EVALUATION

The purpose of the 1988-89 evaluation by the Office of Research, Evaluation, and Assessment/Instructional Support Evaluation Unit (OREA/I.S.E.U.) was to describe the Corrective Mathematics program and to assess its impact on student achievement in mathematics. The following methods were used to conduct this evaluation:

- review of program documents and interviews with program staff were used to describe the program organization and funding, the curriculum, and staff development activities;
- collection of data retrieval forms that report information about grade placement, number of years in the program, frequency of contact time, and referrals to the Clinical and Guidance program;
- analyses of students' scores on standardized mathematics tests administered in the fall and spring of the school year: correlated t-tests were used to determine whether posttest scores were significantly higher than pretest scores;
- one-way analyses of variance with Scheffe post-hocs were used to determine whether Face-to-Face instruction, C.A.I.-only instruction, or combination services produced the highest mean gains on standardized tests;
- classroom observations and teacher interviews and site observations of staff development conferences were used to gather information on program implementation; and
- analyses of a survey filled out by the C.A.I. Corrective Mathematics teachers provided information on teacher perceptions of the C.A.I. program.

SCOPE OF THE REPORT

The purpose of this report is to describe the implementation of the 1988-89 Chapter 1 Corrective Mathematics program and assess its effectiveness. The organization and description of the program are presented in Chapter II. Chapter III presents information on program implementation, including observations of staff development workshops and classroom observations. Chapter IV reports the results of a C.A.I. teacher survey. Attendance, methodology, and major program outcomes are presented in Chapter V. Conclusions and recommendations are offered in Chapter VI. The Appendices include a brief description of Chapter 1 Nonpublic School Reimbursable Services for 1988-89, and a copy of the C.A.I. teacher survey.

II. PROGRAM DESCRIPTION

PROGRAM ORGANIZATION AND FUNDING

During 1988-89, the Corrective Mathematics program, funded at more than 5.3 million, provided instruction to 5806 eligible students in 130 New York City nonpublic schools. Of the 130 schools that participated in the program, 53 received services at M.I.U.s, 19 received services at public school sites, 10 received services at leased neutral sites; two schools were nondenominational and 46 received C.A.I. services. Program staff included a coordinator, two field supervisors, and 70 Corrective Mathematics program teachers.

FACE-TO-FACE INSTRUCTION

Using a pull-out approach, Corrective Mathematics teachers provided instruction to small groups of students one to five times per week for the entire school year. The length of the sessions ranged from 45 to 60 minutes. More than 85 percent of the students received at least two sessions of remedial instruction per week.

Curriculum

An interdisciplinary approach to the development of mathematical concepts and skills was an integral part of the curriculum. Instructional methods were designed to accommodate all learning needs.

First Grade. First-grade students participated in a special readiness program designed to teach them the basic

mathematics concepts considered prerequisites for learning number computations. Instruction emphasized concepts such as geometric shapes, positional relationships, one-to-one correspondence, patterning, ordering, and money values. The program emphasized "learning by doing" activities in which students manipulated objects.

Grades Two Through Twelve. The curriculum for grades two through twelve followed the standard New York City Scope and Sequence.

Parental Involvement

During the 1988-89 school year, the Corrective Mathematics Parental Involvement project contacted and provided materials and take-home kits to 2,781 parents. In addition, 312 parents attended 43 workshops, which were held throughout the year. The workshops focused on ways that parents, by working with their children at home, could enhance mathematical learning.

Time was set aside during staff development workshops to discuss parental involvement and the preparation of materials for parents.

Staff Development

The Corrective Mathematics staff development program was designed to help teachers enhance their professional development and to promote increased parental involvement in the education of their children. Staff development activities included workshops, classroom observations by supervisory staff, and informal information sharing between teachers and supervisory staff.

COMPUTER-ASSISTED INSTRUCTION

Number of Schools Online

By June of 1989, 46 schools were on-line with a program of Computer-Assisted Instruction, showing that 25 schools had been added to the program during the 1988-89 school year. This means that not only was implementation proceeding for schools that went on-line in 1987-88, but also installation and staff training were carried out for the entire school year, since new schools were being added from September, 1988 to June, 1989.

Modes of Instruction

C.A.I. was offered via two modes of instruction. Table 2 shows that approximately four fifths of the 2,117 C.A.I. students received C.A.I. only. They worked in the Chapter 1 computer labs in their nonpublic schools from one to four days a week, in sessions lasting from 30 to 50 minutes. Fourteen percent of the students, from 16 schools, received combination services. These students worked two days a week in the computer lab. In addition, once a week they were bused or escorted to a public school, a neutral site, or an M.I.U. for face-to-face instruction by the same Chapter 1 teacher who monitored their progress with C.A.I.

Computer Software and Students Served

C.A.I. was offered by five computer software companies: ESC, WICAT, CCC, PLATO, and CNS. The hardware configurations for each of these companies are distinct and noninterchangeable; thus a given school can only work with one software package. Nonpublic

TABLE 2

Student Participation in the C.A.I. Corrective Mathematics Program by Grade, Software Package, and Mode of Instruction, 1988-89

Grade	WICAT		CCC		ESC		PLATO		CNS	
	CAI Only	C.S.[a]	CAI Only	C.S.	CAI Only	C.S.	CAI Only	C.S.	CAI Only	C.S.
2	55	19	43		51	36			5	
3	105	17	56		125	31			10	
4	120	11	40		96	31			9	
5	100	12	38		68	23			5	
6	88	12	32		90	22			9	
7	35	6	26		80	15			4	
8	48		11		44		54	35		
9			89							
10			93				23	24		
11			17				12	7		
12			8				3			
Total[b]	551	77	453		554	158	92	66	47	

[a] C.S.= combination services.

[b] Seven students were missing information on their software package. Five of them were combination services, and two were C.A.I.-only.

[c] Information on grade was missing for nine students.

[d] Information on Mode of Instruction was missing for 102 ESC students and one WICAT student.

[e] There were a total of 2,117 C.A.I. students.

- Approximately four fifths of the C.A.I. students received C.A.I.-only instruction.
- Less than one fifth of the C.A.I. students received combination services.

School principals selected the software/hardware configurations for their schools. Table 2 shows the number of students served, by grade, with each of the software packages, in each mode of instruction.

Monitoring Instruction At A Distance

In order to comply with the Supreme Court ruling, Chapter 1 teachers monitor student progress and intervene in the instructional process from computer rooms at the Board of Education's administrative center. One room is shared by ESC and CCC teachers, and another room by WICAT, PLATO, and CNS teachers. The computer rooms have work stations which include both computers and printers. The computer work stations are shared with C.A.I. teachers from the ESL and the Corrective Reading programs. Not only are the computers connected via modems to the NPS Chapter I computer labs, but there are also telephones in each room to allow the Chapter I teachers to speak to the noninstructional technicians who are located at the NPS sites.

The software companies provide teacher manuals which are kept in the computer rooms. These manuals, which vary considerably among software packages, contain information on the operation of the systems, software curriculum contents, and the interpretation of printouts of individual and class progress reports.

The teachers' time in the computer rooms is used for:

- reading printouts of student progress and deciding what, if any, teacher intervention with the software is required;
- previewing student lessons;

- communicating with noninstructional technicians; and
- staff development in C.A.I.

Adapting C.A.I. For NPS Chapter 1 Students

All five software packages were originally designed for learning situations that include a teacher who is physically present as students work on the computers. Therefore, a major task of both the software companies and the Chapter 1 staff has been to find ways of adapting these learning systems to situations in which teachers are not physically present. Teachers must not only learn the system, but they also must work with the software representatives to try to improve remediation and discover ways in which software needs to be amended. Thus for two years, as C.A.I. has been implemented in the nonpublic schools, teacher feedback has contributed in varying degrees to this process.

C.A.I. Staff Development

Besides participating in the staff development of the Corrective Mathematics program, the C.A.I. teachers also received staff development directly from the computer software companies in C.A.I. The software company representatives scheduled training sessions throughout the school year on specific topics, and were available in person and by phone for individual problems. The software companies also provided training to the non-instructional technicians; and hotlines were available for technical assistance.

Since schools were being brought on-line throughout the school year, the training task was made more complex by the differing levels of knowledge of the C.A.I. teachers. The availability, flexibility, and responsiveness of C.A.I. trainers was thus of great importance.

C.A.I. Teacher Expertise. WICAT Systems has prepared a learning improvement plan for Chapter 1 teachers, which is based on a model of three stages that teachers go through to become proficient users of C.A.I. The following is an abbreviated version of these stages.

Stage 1. NOVICES use the system default settings and leave control of instruction to the system.

Stage 2. PRACTITIONERS guide students through the systems, utilize reports, and control the sequence of on-line instruction.

Stage 3. INTEGRATORS and EXTENDERS solve learning problems and create learning opportunities beyond the normal use patterns of the system's instructional design. They find ways to use materials such as workbooks and homework assignments along with the C.A.I. in order to better meet the needs of individual students.

As can be seen from the above, successful adaptation of the C.A.I. systems to the learning needs of Chapter 1 NPS students requires that the C.A.I. teachers progress to stage 3.

C.A.I. Curriculum: Corrective Mathematics

The Corrective Mathematics curriculum varies according to the software package, but basically follows the New York City curriculum. Since Chapter 1 students are below grade level in reading, C.A.I. for the lower grades includes an audio component.

The students wear headphones as they sit at the computers, and thus their instruction does not depend on their reading ability.

The importance of an audio component for the younger Corrective Mathematics students is underscored by the following example of face to face instruction in an M.I.U. A non-C.A.I. teacher was observed teaching a lesson on graphs and numbers to second graders. A work sheet with word problems was part of the lesson. In one of the questions on the work sheet, "How many children in all chose their favorite food?", the children were unable to read the underlined words.

Summary

The 1988-89 Corrective Mathematics program provided face-to-face instruction, C.A.I., and combination services to eligible students from nonpublic schools. In addition, the staff development program provided activities to enhance teachers' professional development and promote increased parental involvement in the education of their children.

III. PROGRAM IMPLEMENTATION

STAFF DEVELOPMENT

Staff development activities for the 1988-89 school year consisted of the following:

- classroom observations of Chapter 1 teachers by field supervisors and postobservation supervisor/teacher conferences;
- staff development conferences given throughout the school year; and
- informal information sharing between the Chapter 1 teachers and staff.

Field Supervision

Classroom observations of Chapter 1 Corrective Mathematics teachers were done either by the program coordinator or the field supervisor. Observations were followed by individual conferences in which supervisory staff provided teachers with helpful feedback and suggestions. For example, one of the teachers showed an OREA observer a teacher-made, brightly colored number line used to communicate place value concepts. The program coordinator suggested this modification of a standard number line after conducting a classroom observation.

Staff Development Topics

Twelve days were set aside for staff development conferences from September 6, 1988 to May 4, 1989. A review of agendas for these conferences shows that, in addition to procedural matters, the distribution of materials, and presentations by mathematics textbook publishers, the following topics were presented:

- reorientation and program overview;
- an introduction to a mathematics laboratory;
- a report on the Parental Involvement Project;
- materials available at the Bronx Mathematics Resource Center;
- Link'n Learn workshops which accommodate different learning styles by connecting auditory and visual inputs;
- teaching mathematics through manipulatives;
- teaching measurement with common household objects;
- a hands-on approach to problem exploration in transformation geometry;
- sharing of "Ideas that Work" by Chapter 1 Corrective Mathematics teachers;
- a "Make and Take" workshop;
- the construction of a first grade assessment;
- the preparation of parental involvement materials;
- an update on mathematics today; and
- factoring and fractions.

Observations of Staff Development

In most conferences, separate topics were covered in the morning and afternoon sessions. Seven of 12 conferences set aside time for networking.

OREA observers went to five staff development conferences held from November 1, 1988 to February 24, 1989. Attendance ranged from 25 to 40 teachers per conference. Teachers actively and enthusiastically participated in both hands-on activities and group discussions. In the conferences which were observed:

- a guided tour was given of the Bronx Mathematics Resource Center. Handouts were distributed for a variety of mathematics activities and games which provided drill and practice in addition, subtraction, multiplication, and division;

- a presentation was given on teaching measurement with common household objects;

- Chapter 1 teachers presented "Ideas that Work", teaching strategies which utilized games and math manipulatives in creative ways;

- a presentation was given on the C.A.I. mathematics curriculum included in the ESC software; and

- a mathematics textbook publisher gave a presentation about texts and teaching materials.

Informal Information Sharing

Chapter I teachers in the Corrective Mathematics Program communicated with one another and with program staff not only during formal conferences, but also informally during lunch and after work. An OREA observer saw one teacher using common household objects-an orange container, a bleach container, a potato chips tin, and a measuring cup-to teach a third grade class about weights and measures. After the class, the observer mentioned to the teacher that she had seen the staff development conference that dealt with using household objects to teach measurement. The teacher replied that while she had been unable to attend the conference, one of her colleagues had called her that evening to tell her about it.

CLASSROOM OBSERVATIONS

OREA observers conducted a series of site observations during the 1988-89 school year in order to gather data on program implementation and to identify linkages between

classroom teaching and staff development. Two Corrective Mathematics teachers were observed during three class sessions each, on three separate occasions, over a four month period. Since both teachers worked in M.I.U.'s, an additional observation was conducted in November at a leased neutral site. At the end of each set of observations, teachers were interviewed about staff development.

Physical Settings

In both the M.I.U. and the leased neutral instructional sites, examples of childrens' work-as well as a variety of instructional tables and problem-solving charts-were prominently displayed. In addition to the above, classrooms contained multiplication tables as well as various measurement, place value, and other instructional charts. Both M.I.U.s had displays of names and photographs of students as well as seasonal displays ranging from snowmen with winter hats to shamrocks to Easter bunnies. There was less physical space in the M.I.U.s than at the leased neutral site, but it was well utilized.

Class Size and Schedules

Class size at both the leased neutral and two M.I.U. instructional sites ranged from six to ten students. Classes met two, three, or four days a week for 45 to 60 minutes.

Student Behavior

In all lessons observed by the OREA team, teachers organized the class time and kept the students engaged in such a way that, with a few exceptions, students were attentive and well behaved.

Upon entering the classroom, students generally settled down within a short time. Teachers taught until the very end of the sessions so that time on task was very high. Teachers used a variety of mathematics games, math manipulatives, teacher-made materials, and creative strategies to keep children engaged. Most students raised their hands frequently and volunteered answers. Overall-as evidenced by their participation-students seemed to enjoy the lessons.

Individualized Instruction

In all of the classes observed, instructors effectively tailored their presentations to the individual needs of the Chapter 1 students. Some of the strategies observed included:

- the use of a variety of concrete examples to illustrate concepts;
- connecting the subject matter to the everyday lives of students;
- the use of games to provide enjoyable drill and practice exercises in basic skills and mathematical facts; and
- the use of frequent positive feedback, both verbal and in the form of checkmarks, stars, or bright red apples pasted onto students' work.

STAFF DEVELOPMENT TECHNIQUES OBSERVED DURING THE LESSONS

Of the 19 lessons OREA staff observed, 11 utilized ideas presented at staff development conferences during the 1988-89 school year. They were as follows:

- in one lesson, weights and measures were taught using common household objects;
- in six lessons, a mathematics game called multiplication bingo was used in grades three through five;

- in two lessons, problem-solving strategies based on a textbook publisher's presentation were utilized;
- one lesson on money was taught using an Addison-Wesley math manipulatives kit with plastic coins;
- in one lesson, a betting game with math manipulatives was used.

In addition, teacher interviews revealed that the problem-solving charts observed in all three classrooms, the use of questions as a teaching strategy, a lesson on graphing, and lessons with calculators were influenced or shaped by staff development conferences held during the 1987-88 school year.

Observations of staff development conferences and classroom teaching, as well as teacher interviews, indicate that Chapter 1 teachers have a rich repertoire of teaching strategies derived from staff development. Moreover, they are keenly interested in and receptive to incorporating new ideas into their lesson plans.

IV. COMPUTER ASSISTED INSTRUCTION TEACHER SURVEY

THE SURVEY

A survey (see Appendix B) was sent to 20 Corrective Mathematics teachers at the end of the 1988-89 school year, in order to gather information on their perceptions of the Corrective Mathematics C.A.I. Program. All 20 teachers returned the survey. Of the five software packages that were used by these 20 teachers, seven used ESC, four used WICAT, four used CCC, and one used PLATO; two used more than one software package. The remaining two did not specify the software package they used, so CNS, the fifth software package, is not included in these results.

Teacher Experience

The majority (75 percent) of the C.A.I. Corrective Mathematics teachers had extensive Chapter 1 teaching experience (ten or more years). None of them had any experience with C.A.I. prior to the implementation of this program. Sixty-five percent did have prior computer experience, and this mainly consisted of informal computer training and college level computer coursework. For eighty-five percent of the teachers the 1988-89 school year was their second year of participation in C.A.I. instruction. The other three teachers were C.A.I. novices.

Grade Levels and Teacher Assignments

Grades one through 12 participated in the C.A.I. Corrective Mathematics Program, the majority of students were in grades two through eight. Ninety-five percent of the 20 teachers were

responsible for at least six grade levels. This meant that teachers who were very familiar with their own lesson plans in non-C.A.I. curricula at a variety of grade levels had to become acquainted with new unfamiliar lesson contents contained in the computer software. The more grade levels a C.A.I. teacher was responsible for, the greater the task was of becoming familiar with these lesson contents.

Teacher assignments included the following modes of instruction: C.A.I.-only, combination services, and Non-C.A.I. Instruction. Some teachers had mixed assignments which included non-C.A.I. as well as C.A.I. students.

The majority of teachers had mixed assignments, so that one to four days a week were spent at various instructional sites where they taught in the face-to-face mode of instruction. Their remaining time was spent monitoring.

Communication with Non-Instructional Technicians and Students

Although half of the teachers worked with one non-instructional technician, the other half worked with two through six technicians since their students were spread out over more than one school. Teachers generally spoke to their technicians several times per week, for a variety of reasons. The two most frequently cited reasons were:

- to resolve technical and mechanical problems; and
- to verify attendance.

Teachers had three ways to communicate with their students: by telephone, electronic mail, and face to face. Most teachers

communicated with an average of 20 students per week.

Of the seven teachers who taught combination Services, three reported that their weekly face-to-face instructional day was their sole means of direct communication with their students. Four teachers, in addition to face-to-face communication, called their students on the telephone. Only one of the combination Services teachers occasionally used electronic mail.

Of the 14 teachers who taught C.A.I.-only students, fifty-seven percent relied solely on the telephone to communicate with their students. Others occasionally used electronic mail.

When teachers were asked how they thought communication with their students and non-instructional technicians could be improved, nine suggested additional conference time with their technicians and students. Other suggestions included:

- additional telephones and computers; and
- teaching students to reach teachers by phone or computer mail.

Software Generated Reports

The majority of the teachers believed the software-generated reports adequately tracked student progress. All of them reported that principals in their schools were satisfied with the progress reports; however, five teachers reported that principals' most frequently asked questions about the reports had to do with their interpretation.

Previewing Lessons

In order for the Chapter 1 Corrective Mathematics teachers to become familiar with the C.A.I. lesson contents, they must

preview the student lessons on the computer at the Board of Education's administrative center.

The C.A.I. teachers reported previewing from 20 percent to 43 percent of their lessons.

One can infer from these data that CAI teachers have varying levels of familiarity with software lesson contents. There may also be features of the individual software packages which make them more or less easy for teachers to preview.

Placement into the Software Curriculum

All of the teachers knew that their software package provided an initial placement test. Half of them used the software placement test, and the rest reported placing the students into the curriculum by means of standardized testing at the beginning of the school year. Initial placement into the software curriculum is important since students must work at an appropriate level of difficulty in order for learning to occur. If the initial placement is accurate, then less time will be taken up with finding the proper difficulty level. Thus placement impacts not only on the amount of instructional time, but also on the benefit students derive from instruction. There may be differences in the placement tests for each software package which make them more or less easy to use.

Adjusting Software Difficulty Level

Although the four software packages differ with respect to both lesson content and the way that the content is organized (i.e., lesson modules of varying length and different groupings

of subject matter), there is one organizational principle that they share. That is, the lesson sequences are determined by the difficulty level of the material. They roughly follow the scope and sequence of New York City schools, with a focus on basic skills in the lower grades and more complex skills in the higher grades. Problem solving and word problems are treated differently by the different software packages.

In addition to this organizational principle, the four software packages have in common a principle of mastery learning. That is, a student must sufficiently master the information at one level of difficulty before moving on to the next. The level of mastery required to move from one lesson or set of lessons to another varies according to the software. Generally, about 80 percent or more of the questions in a module must be answered correctly for the student to move on. If a student consistently fails to meet the mastery criteria, or if the criteria is consistently exceeded, then the difficulty level of the lessons must be adjusted in order for learning to occur.

While in some cases it is possible for the software to make this adjustment, automatic difficulty adjustments do not always meet the needs of the individual learner. Therefore, this is an area where Chapter 1 teachers can provide useful input into the learning progress. The teachers at the administrative center can monitor student progress by looking at printouts. Then, if necessary, they can fine tune the difficulty level of the student lessons.

Teachers reported adjusting software difficulty level once a month or less often.

Responsiveness of Software Companies

Sixteen teachers rated the four software companies on their responsiveness to teacher requests and suggestions. While the number of teachers was not evenly distributed, Table 3 shows that all but one teacher rated their software companies as somewhat to moderately responsive to teacher requests and suggestions. The one PLATO teacher gave a rating of very responsive.

Teacher Suggestions for Improving Lesson Content

Sixteen teachers offered suggestions for improving lesson contents. Among the suggestions were:

- There should be greater detail in pointing out errors in problem-solving activities.
- The sequencing of materials should be improved.
- More word-problems should be included.
- Reinforcement of basic skills should be improved.
- The way the software corrects errors needs to be improved.
- One teacher said that the software needs more "branching". If a student gets a wrong answer, the software re-presents the question in a different form. However, if the student keeps getting a particular type of question wrong, there are not enough alternate forms, or "branches" for effective remediation.
- Lessons should relate more to classroom work.
- Concepts should be developed more fully.
- The graphics of the money-related lessons should be improved.

TABLE 3

Teacher Ratings of Software Companies' Responsiveness

Responsiveness	Number of Responses			
	ESC (N=7)	WICAT (N=4)	CCC (N=4)	PLATO (N=1)
Very Responsive to Requests and Suggestions				1
Moderately Responsive	1	2		
Somewhat Responsive	6	2	4	
Not At All Responsive				

- Twelve out of 16 teachers perceived their software companies as only somewhat responsive to their requests and suggestions.

- An increase of problem solving activities, which should include help options, is needed.
- There are insufficient remedial lessons and activities, in the upper grades, and these should be improved.

Combination Services

Use of Face-to-Face Instructional Time. Teachers reported using their face-to-face instructional time to reinforce basic skills. They also reported dealing with:

- concept development;
- error analysis; and
- drill and practice.

Differences Between C.A.I. and Non-C.A.I. Instruction

When teachers compared the face-to-face with the C.A.I. instruction for combination services students, they all offered this single main contrast:

- Face-to-face instruction includes the use of hands-on manipulatives to enhance the understanding of concepts and skills; they are constantly revised and developed according to student interest and responses. In contrast, the C.A.I. curriculum is preprogrammed and changes are made only after printouts reveal problems, if then.

SUMMARY OF SURVEY FINDINGS

At the end of the 1988-89 school year, 20 C.A.I. teachers completed a survey of their perceptions of the C.A.I. program. Some of the key findings of this survey were:

- While the majority of C.A.I. teachers had extensive Chapter 1 teaching experience, they were inexperienced with C.A.I.
- Most of the teachers had mixed assignments, which included C.A.I. as well as non-C.A.I. students. This meant their time was divided between teaching at various instructional sites, and monitoring progress in C.A.I. from the Board of

Education's administrative center.

- C.A.I. teachers communicated with non-instructional technicians several times a week to verify attendance, and to deal with a variety of technical problems.

- C.A.I.-only teachers chiefly relied on the telephone to communicate with their students; and combination services teachers relied on their day of face-to-face instruction.

- The majority of C.A.I. teachers (14 out of 15 respondents) believed that software-generated reports adequately tracked student progress, and reported that school principals were satisfied with the reports. However, principals' most frequently asked questions had to do with report interpretation.

- Teachers reported previewing from 20 percent to 43 percent of their lessons.

- Half of the teachers reported using software placement tests, the rest placed students into the software curriculum by means of standardized tests at the beginning of the school year.

- Overall, teachers adjusted the difficulty level of the software lessons at intervals varying from twice a month to less often than once a month. None made weekly adjustments.

- The majority of teachers rated their software companies as somewhat to moderately responsive to teacher requests and suggestions.

- One of the teachers said that if a student gives a wrong answer, the software does not have enough 'branches' or alternate ways to re-present the question, for effective remediation.

- A major feature of C.A.I. which distinguishes it from face-to-face instruction is the absence of hands-on math manipulatives, which can be varied according to student needs and interests.

V. STUDENT OUTCOMES

ATTENDANCE

Students in the Corrective Mathematics program attended class one to five times per week for sessions lasting from 45 to 60 minutes. Most students, 92 percent, attended classes lasting 45 minutes or longer. Moreover, most students, more than 75 percent, attended class two times per week, and another 18 percent of students attended class three or more times per week. The average rate of attendance for program students was 93.7 percent*.

METHODOLOGY

The impact of the 1988-89 Corrective Mathematics program on student achievement was determined by analyzing scores on standardized tests administered in the fall of 1988 and the spring of 1989. Only students who participated in the program for at least five months, and for whom both pretest and posttest scores were available, were included in the analyses.

The main objective for the 1988-89 Corrective Mathematics program was a statistically significant mean gain from pretest to posttest. To measure whether the program reached this goal, students' raw scores were converted to N.C.E.s, and statistical analyses were carried out on these converted scores. Correlated *t*-tests were used to determine whether the mean gains were

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*Aggregate attendance information was provided by the Chapter 1 program administration.

statistically significant. Statistical significance indicates whether the changes in achievement are real or occurred by chance. However, statistical significance can be exaggerated by large sample size or depressed by small sample size. Furthermore, statistical significance does not address the issue of whether the achievement changes are important to the students' educational development. Thus, an effect size (E.S.)* is reported for each result to indicate the educational meaningfulness of each mean gain or loss, independent of the sample size.

One-way analyses of variance with Scheffe post-hoc were also used to compare the mean gains for students in different modes of instruction.

Standardized Tests Used to Measure Achievement

First graders took the mathematics section of the SESAT. Second through eighth graders took the Concepts, Computation, and Applications subtests of the S.A.T. For the second grade only, the Computation and Applications subtests were combined. Ninth through twelfth graders took the mathematics section of the Stanford Test of Academic Skills (TASK). Therefore, analyses are presented for:

- the total SESAT score;
- the total S.A.T. score;

*The effect size, developed by Jacob Cohen, is the ratio of the mean gain to the standard deviation of the gain. This ratio provides an index of improvement irrespective of the size of the sample. According to Cohen, .2 is a small effect size, .5 is a moderate effect size, and .8 is a large effect size. Only effect sizes of .8 and above are considered educationally meaningful.

- the scores of the individual S.A.T. subtests; and
- the total TASK score.

ACADEMIC ACHIEVEMENT FOR STUDENTS RECEIVING FACE-TO-FACE INSTRUCTION

Tables 4 through 9 present the achievement results for students who received face-to-face instruction. Except for grades ten through 12, where the small numbers of students did not allow the computation of statistical significance, the students in all grades met the program's criterion for success.

Total Scores of Norm Referenced Tests

Tables 4, 5 and 6 present the results for the Total scores on the SESAT, the S.A.T., and the TASK for students in grades one through 12.

The SESAT. Table 4 shows that:

- The mean gain of 26.6 N.C.E.s for first grade students on the SESAT was statistically significant, and represented an educationally meaningful effect size.

The Total Score of the S.A.T. Table 5 shows that:

- The mean gain of 13.9 N.C.E.s for students in grades two through eight on the total score of the S.A.T. was statistically significant, and represented an educationally meaningful effect size.
- Mean gains ranged from 5.8 N.C.E.s for the eighth grade to 20.4 N.C.E.s for the second grade.
- The effect sizes for grade five and eight were moderate. All other effect sizes were educationally meaningful.

The TASK. Table 6 shows that:

- The overall mean gain of 10.4 N.C.E.s for student in grades nine through 12 was statistically significant, and represented an educationally meaningful effect size.

TABLE 4

Mean N.C.E. Differences on the SESAT Total Score for Full-Year Face-to-Face First Grade Students in the Corrective Mathematics Program, 1988-89

Grade	N	Pretest Mean	Pretest S.D.	Posttest Mean	Posttest S.D.	Difference[a] Mean	Difference[a] S.D.	Effect Size
1	88	11.8	10.8	38.4	15.4	26.6	15.2	1.8

[a] This mean difference was statistically significant at the $p \leq .05$ level.

- First graders achieved a mean gain of 26.6 N.C.E.s on the total mathematics score of the SESAT.
- Their mean gain was statistically significant, and it represented an educationally meaningful effect size.

TABLE 5

Mean N.C.E. Differences on the Total Score of the S.A.T. for Full-Year Face-to-Face Students in Grades Two through Eight in the Corrective Mathematics Program, 1988-89

		Pretest		Posttest		Difference[a]		Effect
Grade	N	Mean	S.D.	Mean	S.D.	Mean	S.D.	Size
2	613	19.3	12.1	39.7	16.2	20.4	13.9	1.5
3	647	21.0	11.6	35.5	15.9	14.5	12.5	1.2
4	637	26.5	11.3	41.2	15.0	14.7	12.5	1.2
5	522	25.5	11.2	35.0	15.7	9.5	13.3	0.7
6	407	25.2	11.1	38.0	13.7	12.8	12.3	1.0
7	223	33.5	9.2	42.3	10.5	8.8	11.0	0.8
8	117	31.9	10.5	37.7	12.5	5.8	9.9	0.6
Total	3,166	24.4	12.0	38.3	15.2	13.9	13.3	1.0

[a] All mean differences were statistically significant at the $p \leq .05$ level.

- The overall mean gain of 13.9 N.C.E.s was statistically significant and represented an educationally meaningful effect size.
- Mean gains ranged from 5.8 N.C.E.s for eighth grade students to 20.4 N.C.E.s for second grade students.
- Effect sizes for the fifth and sixth grades were moderate. All other effect sizes were educationally meaningful.

TABLE 6

Mean N.C.E. Differences on the Total Score of the TASK for Full-Year Face-to-Face Students in Grades Nine through Twelve in the Corrective Mathematics Program, 1988-89

Grade	N	Pretest Mean	Pretest S.D.	Posttest Mean	Posttest S.D.	Difference[a] Mean	Difference[a] S.D.	Effect Size
9	21	25.0	9.7	35.6	12.0	10.6	6.7	1.6
10	9	24.6	14.0	34.0	11.5	9.4	10.9	NA
11	4	15.8	6.5	27.0	1.6	11.2	5.0	NA
12	2	10.5	13.4	22.0	4.2	11.5	9.2	NA
Total	36	23.1	11.2	33.5	11.4	10.4	7.6	1.4

[a] Except for grades 10 through 12, with small numbers of students, mean differences were statistically significant at the $p \leq .05$ level.

- The overall mean gain of 10.4 N.C.E.s was statistically significant and represented an educationally meaningful effect size.
- Mean gains ranged from 9.4 N.C.E.s for tenth grade students to 11.5 N.C.E.s for twelfth grade students.
- The effect size for grade nine, and the overall effect size were educationally meaningful.

- The numbers of students in grades 10 through 12 were too small to compute statistical significance.

- The mean gain of 10.6 N.C.E.s for students in the ninth grade was statistical significant, and represented an educationally meaningful effect size.

The Concepts Subtest of the S.A.T.

Table 7 presents the results for students in grades two through eight who took the Concepts subtest of the S.A.T.

- The overall mean gain of 16.4 N.C.E.s (S.D.=20.6) was statistically significant, and represented an educationally meaningful effect size.

- Mean gains ranged from 7.5 N.C.E.s (S.D.= 15.7) for eighth grade students to 22.5 N.C.E.s (S.D.= 21.5) for second grade students.

- Effect sizes for grades five, seven, and eight were moderate. All other effect sizes were large and educationally meaningful.

The Computation Subtest of the S.A.T.

Table 8 presents the results for students in grades two through eight who took the Computation subtest of the S.A.T.

- The overall mean gain of 19.8 N.C.E.s (S.D.=23.8) was statistically significant, and represented an educationally meaningful effect size.

- Mean gains ranged from 9.4 N.C.E.s (S.D.= 19.7) for seventh grade students to 24.4 N.C.E.s (S.D.= 22.2) for second grade students.

- The effect sizes for grades five, seven, and eight were moderate. All other effect sizes were educationally meaningful.

- The mean posttest score of 48.4 N.C.E.s (S.D.= 26.8) for fourth grade students was only 1.6 N.C.E.s away from grade level performance.

The Applications Subtest of the S.A.T.

Table 9 presents the results for students in grades three through eight who took the Applications subtest of the S.A.T.

TABLE 7

Mean N.C.E. Differences on the Concepts Subtest
of the Stanford Achievement Test
for Full-Year Face-to-Face Students
in the Corrective Mathematics Program by Grade, 1988-89

		Pretest		Posttest		Difference[a]		Effect
Grade	N	Mean	S.D.	Mean	S.D.	Mean	S.D.	Size
2	629	11.9	12.9	34.4	23.7	22.5	21.5	1.0
3	652	15.5	12.8	31.3	21.9	15.8	19.7	0.8
4	640	19.1	14.7	38.0	24.7	19.0	21.6	0.9
5	522	22.9	16.5	33.8	22.8	10.9	19.8	0.6
6	406	21.9	16.8	37.1	21.4	15.2	19.4	0.8
7	223	26.3	15.6	40.0	17.8	13.7	18.5	0.7
8	117	22.9	14.8	30.4	19.2	7.5	15.7	0.5
Total	3189	18.6	15.3	35.0	22.7	16.4	20.6	0.8

[a] All mean differences were statistically significant at the $p \leq .05$ level.

- The overall mean gain of 16.4 N.C.E.s was statistically significant and represented an educationally meaningful effect size.
- Mean gains ranged from 7.5 N.C.E.s for eighth grade students to 22.5 N.C.E.s for second grade students.
- Effect sizes for grades five, seven, and eight were moderate. All other effect sizes were large and educationally meaningful.

TABLE 8

Mean N.C.E. Differences on the Computation Subtest
of the Stanford Achievement Test
for Full-Year Face-to-Face Students
in the Corrective Mathematics Program by Grade, 1988-89

Grade	N	Pretest Mean	Pretest S.D.	Posttest Mean	Posttest S.D.	Difference[a] Mean	Difference[a] S.D.	Effect Size
2[b]	614	12.8	13.2	37.2	24.3	24.4	22.2	1.1
3	652	17.7	17.4	38.1	28.0	20.4	24.7	0.8
4	640	22.9	18.4	48.4	26.8	25.5	25.4	1.0
5	523	19.2	15.0	35.7	26.1	16.5	24.5	0.7
6	407	18.6	14.8	34.7	22.8	16.1	20.3	0.8
7	223	25.8	15.6	35.2	17.5	9.4	19.7	0.5
8	117	21.7	15.7	32.3	21.5	10.5	19.7	0.5
Total	3176	18.9	16.4	38.7	25.7	19.8	23.8	0.8

[a] All mean differences were statistically significant at the $p \leq .05$ level.

[b] Second grade students took a combined Computations and Applications subtest.

- The overall mean gain of 19.8 N.C.E.s was statistically significant and represented an educationally meaningful effect size.
- Mean gains ranged from 9.4 N.C.E.s for seventh grade students to 24.4 N.C.E.s for second grade students.
- Effect sizes for grades five, seven and eight were moderate. All other effect sizes were educationally meaningful.
- The mean posttest score of 48.4 N.C.E.s for fourth grade students was only 1.6 N.C.E.s away from grade level performance.

TABLE 9

Mean N.C.E. Differences on the Applications Subtest
of the Stanford Achievement Test
for Full-Year Face-to-Face Students
in the Corrective Mathematics Program by Grade[a], 1988-89

Grade	N	Pretest Mean	Pretest S.D.	Posttest Mean	Posttest S.D.	Difference[b] Mean	Difference[b] S.D.	Effect Size
3	650	12.8	13.0	29.4	21.6	16.6	19.5	0.9
4	637	18.7	13.7	30.6	19.8	11.9	16.7	0.7
5	523	14.1	12.4	25.4	20.8	11.2	18.8	0.6
6	407	16.5	14.6	29.7	20.0	13.2	18.5	0.7
7	223	22.2	13.3	38.9	19.8	16.7	19.0	0.9
8	118	20.9	14.4	30.9	20.6	10.0	15.9	0.6
Total	2558	16.3	13.7	29.8	20.8	13.5	18.5	0.7

[a] Second grade students took a combined Computation and Applications test.

[b] All mean differences were statistically significant at the $p \leq .05$ level.

- The overall mean gain of 13.5 N.C.E.S was statistically significant and represented a moderate effect size.
- Mean gains ranged from 10 N.C.E.s for the eighth grade to 16.7 N.C.E.s for the seventh grade.
- The effect sizes for grades three and seven were educationally meaningful. Other effect sizes were moderate.

- The overall mean gain of 13.5 N.C.E.s (S.D.= 18.5) was statistically significant, and represented a moderate effect size.
- Mean gains ranged from 10.0 N.C.E.s (S.D.= 15.9) for the eighth grade to 16.7 N.C.E.s (S.D.= 19.0) for the seventh grade.
- The effect sizes for grades three and seven were educationally meaningful. Other effect sizes were moderate.

ACADEMIC ACHIEVEMENT FOR STUDENTS RECEIVING COMPUTER ASSISTED INSTRUCTION

The Corrective Mathematics program C.A.I. students received instruction via five different software packages. There were also two different modes of instruction used, which have been described earlier: C.A.I.-only, and combination services. In this section we will first present the results for all C.A.I. students, across software packages and modes of instruction.

Finally, we will present the following sets of contrasts:

- Overall achievement (across software packages) will be compared for C.A.I.-only, and combination services, and Face-to-Face instruction.

Achievement For All C.A.I. Students

Tables 10 through 14 present the achievement results for all of the C.A.I. students. Except for grade 12, where the small number of students did not permit the computation of statistical significance; and also for grade 11, whose mean gain on the TASK was not significant, the mean gains for all grades on all test scores met the program's criterion for success.

Total Scores on Norm-Referenced Tests. Tables 10 and 11 present the results for students in grades two through eight on the total score of the S.A.T., and for grades nine through 12 on

TABLE 10

Mean N.C.E. Differences on the Total Mathematics Score of the S.A.T for Full-Year C.A.I. Corrective Mathematics Students in Grades Two through Eight, 1988-89

Grade	N	Pretest Mean	Pretest S.D.	Posttest Mean	Posttest S.D.	Difference[a] Mean	Difference[a] S.D.	Effect Size
2	180	18.9	13.0	35.9	17.4	17.0	15.0	1.1
3	303	22.0	11.2	29.7	15.2	7.7	12.5	0.6
4	279	27.0	10.5	36.3	14.5	9.3	12.1	0.7
5	220	25.9	11.2	29.4	16.9	3.5	12.8	0.3
6	224	25.0	10.5	30.3	14.7	5.3	11.9	0.5
7	140	31.7	9.1	35.3	9.3	3.6	9.0	0.4
8	92	28.8	10.7	31.1	12.5	2.3	10.1	0.2
Total	1,438	25.0	11.5	32.4	15.2	7.4	13.0	0.6

[a] All mean differences were statistically significant at the $p \leq .05$ level.

- The overall mean gain of 7.4 N.C.E.s was statistically significant, and represented a moderate effect size.
- Mean gains ranged from 2.3 N.C.E.s for the eighth grade to 17.0 N.C.E.s for the second grade.
- The effect size for the second grade was educationally meaningful. Other effect sizes were small to moderate.

TABLE 11

Mean N.C.E. Differences on the Total Mathematics Score of the TASK for Full-Year C.A.I. Corrective Mathematics Students in Grades Nine through Twelve, 1988-89

		Pretest		Posttest		Difference		Effect
Grade	N	Mean	S.D.	Mean	S.D.	Mean	S.D.	Size
9	165	30.5	10.0	37.2	12.0	6.7[a]	11.1	0.6
10	137	34.3	9.7	38.9	9.9	4.6[a]	9.6	0.5
11	29	29.2	9.4	31.7	9.8	2.5	10.0	0.3
12	5	26.0	10.1	28.8	11.6	2.8	4.3	n.a.
Total	336	31.8	10.0	37.3	11.2	5.5[a]	10.4	0.5

[a] These mean differences were statistically significant at the $p \leq .05$ level.

- The overall mean gain of 5.5 N.C.E.s was statistically significant, and represented a moderate effect size.
- Mean gains ranged from 2.5 N.C.E.s for the eleventh grade to 6.7 N.C.E.s for the ninth grade.
- Effect sizes were small to moderate.

the total score of the TASK. There were no C.A.I. first grade students who were both pre- and posttested on the SESAT.

The Total Score of the S.A.T. Table 10 shows that:

- The overall mean gain of 7.4 N.C.E.s on the S.A.T. for C.A.I. students in grades two through eight was statistically significant, and represented a moderate effect size.
- Mean gains ranged from 2.3 N.C.E.s for the eighth grade to 17.0 N.C.E.s for the second grade.
- The effect size for the second grade was educationally meaningful. All other effect sizes were small or moderate.

The TASK. Table 11 shows that:

- The overall mean gain of 5.5 N.C.E.s for C.A.I. students in grades nine through 12 on the TASK was statistically significant, and represented a moderate effect size.
- Mean gains ranged from 2.5 N.C.E.s for the eleventh grade to 6.7 N.C.E.s for the ninth grade.
- The effect sizes were moderate or small.

The Concepts Subtest of the S.A.T. Table 12 presents the results for students in grades two through eight on the Concepts subtest of the S.A.T.

- The overall mean gain of 10.5 N.C.E.s (S.D.= 20.4) was statistically significant, and represented a moderate effect size.
- Mean gains ranged from 5.3 N.C.E.s (S.D.= 18.0) for the seventh grade to 20.6 N.C.E.s (S.D.= 0.9) for the second grade.
- The effect size for the second grade was educationally meaningful. Other effect sizes were small or moderate.

The Computation Subtest of the S.A.T. Table 13 presents the results for the combined Computation-Applications subtest for the second grade, and also the Computation subtest for students in grades three through eight.

TABLE 12

Mean N.C.E. Differences for Full-Year C.A.I. Corrective Mathematics Students by Grade on the Concepts Subtest of the Stanford Achievement Test, 1988-89

Grade	N	Pretest Mean	Pretest S.D.	Posttest Mean	Posttest S.D.	Difference[a] Mean	Difference[a] S.D.	Effect Size
2	182	12.8	13.9	33.4	26.2	20.6	23.0	0.9
3	311	16.5	13.2	25.5	20.8	9.0	17.7	0.5
4	284	19.4	15.3	35.3	23.9	15.9	21.5	0.7
5	225	22.1	16.1	28.3	23.6	6.2	20.1	0.3
6	226	21.6	16.3	28.2	20.5	6.6	18.8	0.3
7	141	25.9	15.5	31.2	15.3	5.3	18.0	0.3
8	92	21.4	15.8	28.0	21.0	6.6	18.3	0.4
Total	1461	19.5	15.5	30.0	22.4	10.5	20.4	0.5

[a] All mean differences were statistically significant at the $p \leq .05$ level.

- The overall mean gain of 10.5 N.C.E.s was statistically significant, and represented a moderate effect size.
- Mean gains ranged from 5.3 N.C.E.s for the seventh grade to 20.6 N.C.E.s for the second grade.
- The effect size for the second grade was educationally meaningful. Other effect sizes were small or moderate.

TABLE 13

Mean N.C.E. Differences for Full-Year
C.A.I. Corrective Mathematics Students by Grade
on the Computation Subtest of the Stanford Achievement Test,
1988-89

Grade[a]	N	Pretest		Posttest		Difference[b]		Effect Size
		Mean	S.D.	Mean	S.D.	Mean	S.D.	
2	180	12.5	12.9	31.2	22.6	18.7	21.6	0.9
3	310	17.9	15.8	28.6	25.7	10.7	25.0	0.4
4	284	23.6	18.1	40.7	26.5	17.1	26.6	0.6
5	225	20.2	17.9	28.2	26.4	8.0	24.9	0.3
6	227	20.3	16.1	25.8	20.9	5.5	18.6	0.3
7	141	22.4	13.8	25.0	15.8	2.6	15.2	0.2
8	92	17.8	14.9	22.5	16.7	4.7	13.1	0.4
Total	1459	19.5	16.4	30.0	24.2	10.5	23.2	0.5

[a] Second grade students took a combined Computation-Applications subtest.

[b] All mean differences were statistically significant at the $p \leq .05$ level.

- The overall mean gain of 10.5 N.C.E.s was statistically significant, and represented a moderate effect size.
- Mean gains ranged from 2.6 N.C.E.s for the seventh grade to 18.7 N.C.E.s for the second grade.
- The effect size for the second grade was educationally meaningful. The other effect sizes were small or moderate.

- The overall mean gain of 10.5 N.C.E.s (S.D.= 23.2) was statistically significant, and represented a moderate effect size.
- Mean gains ranged from 2.6 N.C.E.s (S.D.= 15.2) for the seventh grade to 18.7 N.C.E.s (S.D.= 21.6) for the second grade.
- The effect size for the second grade was educationally meaningful. The other effect sizes were small or moderate.

The Applications Subtest of the S.A.T. Table 14 presents the achievement results for students in grades three through eight on the Applications subtest of the S.A.T.

- The overall mean gain of 6.8 N.C.E.s (S.D.= 17.2) was statistically significant, and represented a small effect size.
- Mean gains ranged from 4.3 N.C.E.s (S.D.= 17.4) for the fifth grade to 7.6 N.C.E.s (S.D.= 16.3) for the seventh grade.
- All effect sizes were small or moderate.

CONTRASTS OF MEAN GAINS

This next section contrasts the overall mean gains of students receiving Face-to-Face instruction, C.A.I.-only and combination services.

Contrasts Between Modes of Instruction

Table 15 presents contrasts of the overall mean gains on the subtests and total score of the S.A.T., and also the total score of the TASK, for students receiving instruction in three different modes.

Face-to-Face vs. C.A.I.-only vs. Combination Services Table 15 shows that it is important to distinguish between students who received C.A.I.-only instruction, and students who received combination services.

TABLE 14

Mean N.C.E. Differences for Full-Year C.A.I. Corrective Mathematics Students by Grade on the Applications Subtest of the Stanford Achievement Test, 1988-89

Grade[a]	N	Pretest Mean	Pretest S.D.	Posttest Mean	Posttest S.D.	Difference[b] Mean	Difference[b] S.D.	Effect Size
3	309	14.0	13.4	22.6	19.0	8.6	18.7	0.5
4	281	18.1	12.4	23.7	18.9	5.6	16.2	0.4
5	225	14.7	13.5	19.0	19.9	4.3	17.4	0.3
6	224	13.6	12.3	21.9	19.0	8.3	16.1	0.5
7	139	20.2	13.5	27.8	14.9	7.6	16.3	0.5
8	91	16.2	15.2	21.1	17.6	4.8	17.2	0.3
Total	1269	15.8	13.3	22.6	18.6	6.8	17.2	0.4

[a] For grade two, the Computation and Applications subtests were combined, and their results are on the Computation subtest table.

[b] All mean differences were statistically significant at the $p \leq .05$ level.

- The overall mean gain of 6.8 N.C.E.s was statistically significant, and represented a small effect size.
- Mean gains ranged from 4.3 N.C.E.s for the fifth grade to 7.6 N.C.E.s for the seventh grade.
- Effect sizes were moderate or small.

TABLE 15

Comparison of Overall Mean N.C.E. Differences for Full-Year Corrective Mathematics Program Students Receiving Face-to-Face Instruction, C.A.I.-only Instruction, and Combination Services, on the Total Score and the Three Subtests of the S.A.T., and on the Total Score of the TASK, 1988-89

	Face-to-Face Instruction			C.A.I.-only[b] Instruction			Combination[c] Services		
Subtest	N	Mean Difference	S.D.	N	Mean Difference	S.D.	N	Mean Difference	S.D.
Grades Two Through Eight									
Total	3,166	13.9[a]	13.3	1226	6.0[a]	12.4	212	15.3[a]	13.5
Concepts	3,189	16.4[a]	20.6	1241	9.1[a]	19.9	220	18.3[a]	21.7
Comput.	3,176	19.8[a]	23.8	1242	9.3[a]	23.0	217	17.9[a]	23.3
Applic.	2,558	13.5[a]	18.5	1102	5.8[a]	16.3	167	12.8[a]	19.4
Grades Nine Through Twelve									
Total Score on TASK	36	10.4[a]	7.6	278	4.2[a]	10.1	58	11.4[a]	9.8

[a] These mean gains were statistically significant at the $p \leq .05$ level.

[b] These totals include students using WICAT, ESC, and CCC in grades two through eight; and PLATO and CCC in grades nine through twelve.

[c] These totals include students using WICAT and ESC in grades two through eight, and CCC and PLATO in grades nine through twelve.

- For all grades, on all tests, analyses of variance revealed that there was no significant ($p \leq .05$) difference in mean gains between Face-to-Face instruction and combination services.
- For all grades, on all tests, analyses of variance revealed that the mean gains of students who received C.A.I.-only instruction were significantly ($p \leq .05$) lower than the mean gains for both the combination services and Face-to-Face instruction.

- For all grades, on all tests, analyses of variance revealed that there was no significant ($p \leq .05$) difference in mean gains between Face-to-Face instruction and combination services.

- For all grades, on all tests, analyses of variance revealed that the mean gains of students who received C.A.I.-only instruction were significantly ($p \leq .05$) lower than the mean gains for both Combination Services and Face-to-Face instruction.

These results show that C.A.I. alone does not impact as strongly on student achievement as face-to-face instruction. However, for this sample of students, C.A.I. in the form of combination services does equal the effectiveness of face-to-face instruction.

COMPARISON WITH PAST YEARS

Table 16 shows that the mean N.C.E. Gains for Corrective Mathematics program students in grades one through twelve for the last four school years, 1984-85 through 1988-89, were statistically significant, and effect sizes were large and educationally meaningful. These gains remained relatively stable for this period at nearly three times the program objective of a five N.C.E. gain up until 1988-89, when the objective was changed to statistical significance.

Since this is the first year of evaluating the achievement of C.A.I. students, yearly comparisons of C.A.I. student achievement will begin with the 1989-90 evaluation report.

TABLE 16

Mean N.C.E. Gains of Full-Year Face-to-Face Corrective Mathematics Students on Norm-Referenced Mathematics Tests, 1984-85 to 1988-89

Year	Number[a] of Students	Mean[b] Gain	Standard Deviation	Effect Size
1984-85	8,215	14.4	13.3	1.1
1985-86	7,600	14.5	13.1	1.1
1986-87	3,877	13.8	13.3	1.0
1987-88	3,699	16.5	14.0	1.2
1988-89	3,290	14.2	13.5	1.1

[a] The overall mean gain for 1988-89 does not inlcude the 1,774 C.A.I. students who were both pretested and posttested. Their mean gain was 7.1 N.C.E.s, which represented a moderate effect size. Yearly comparisons of the mean gains for C.A.I. students will begin with the 1989-90 evaluation report.

[b] All differences were statistically significant at the $p \leq .05$ level.

- The mean gains for each of the five school years remained basically stable.
- The effect sizes for each of the five school years were large and educationally meaningful.

VI. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

During the 1988-89 school year, the Corrective Mathematics program, in addition to offering face-to-face instruction, was in its second year of implementing a Computer Assisted Instruction (C.A.I.) component. The C.A.I. program expanded into 25 new schools, and the number of C.A.I. students more than doubled from 955 students in 1987-88 to 2,117 students in 1988-89.

Face-to-Face Instruction

Program Implementation. Site observations, review of program documents, and staff interviews all indicated that the Corrective Mathematics program was being implemented as proposed.

- A Parental Involvement program was in place, which provided materials and take-home kits to 2,781 parents, and which conducted 43 workshops in the course of the school year.
- The goals of the program were all being addressed by the Chapter I teachers' instructional strategies.
- The staff development program offered multifaceted training on a wide variety of topics. The Chapter I teachers utilized a rich repertoire of teaching strategies derived from staff development.

Student Achievement. Analyses of standardized mathematics tests show that the mean gains for students in grades one through nine on all tests reached statistical significance, and thus met the program's criterion of success.

Computer-Assisted Instruction

Program Implementation. Site observation and staff interviews indicated that the instructional software used for C.A.I. must be specially adapted for use in settings where a teacher is not physically present; and also that a high level of teacher expertise with the C.A.I. systems is essential for effective remediation.

- Teachers have the ability to adjust the difficulty level of the software as they monitor instruction from the Board of Education's administrative center; after examining printouts and speaking to non-instructional technicians, they can move students into harder or easier lessons.
- If the software cannot easily re-present topics for additional practice or explanations, then students must repeat entire lessons. In order to avoid this, the software must be adapted and/or teachers must find ways of getting the students the practice and explanations they need.

Teacher Expertise. WICAT Systems has developed a learning model for teachers who use C.A.I., in which teachers progress through three stages of expertise. This highlights the necessity for Chapter 1 teachers to become expert users of C.A.I., if remediation at a distance is to be effective.

- C.A.I. teachers, as part of gaining expertise, must become familiar with software lesson contents. The more grade levels for which they are responsible, the more lesson contents there are to learn.
- Since the software companies' staff developers were not at Baltic Street five days a week, and since the majority of teachers were in the field from one to four days a week, there is a good possibility that some teachers received more C.A.I. training than others. However, strong networking between the Corrective Mathematics program teachers and staff may have compensated for this.

The responses of 20 C.A.I. teachers to a C.A.I. survey indicated that:

- Since the majority of teachers had mixed assignments that included being in the field from one to four days a week and since 19 out of 20 respondents were responsible for at least six grade levels, teachers had many lessons to preview within the number of days determined by their teaching assignments.
- Since all but one of the C.A.I. respondents rated their software companies as only somewhat to moderately responsive to teacher input and suggestions, it is likely that software companies could benefit from additional teacher input as they continue to adapt their software.

Student Achievement. There were not enough students in the twelfth grade to compute statistical significance; and the mean gain on the TASK for all eleventh grade students (who used either CCC or PLATO software) was not significant. There were no first grade students. However,

- The overall mean gains of all C.A.I. students combined, on all tests, in grades two through ten, on all tests, reached statistical significance and thus met the program's criterion for success.

Contrasts of Mean Gains. The following conclusions may be drawn from contrasts of mean gains between modes of instruction:

- Results of analyses of variance show that C.A.I.-only instruction does not impact as strongly on student achievement as does face-to-face instruction. However, for this sample of students, C.A.I. in the form of combination services is equal in effectiveness to face-to-face instruction.

RECOMMENDATIONS

Based on the information and analyses presented in this report, the following recommendations are made:

Face-to-Face Instruction

- Since program objectives were met by all grades on all tests, staff development and classroom instruction should continue as currently organized.

- Ways of expanding the Parental Involvement program should be explored.

- Ways of expanding the Parental Involvement program should be explored. Perhaps a newsletter distributed to parents periodically could include parent-child mathematics activities.

Computer-Assisted Instruction

- The achievement of students who received combination services was significantly greater than the achievement of students receiving C.A.I.-only. Provided these results hold up for another year, an effort should be made to expand combination services whenever feasible.

- Efforts should continue to adapt the instructional software for use in settings where a teacher is not physically present. As part of this effort, software companies should be evaluated for their receptivity to input from the Chapter 1 teachers.

- In the interest of helping teachers acquire the necessary expertise with the C.A.I. systems, software companies should adjust their trainers' schedules to accommodate teachers who spend several days a week in the field.

- C.A.I. staff developers should include sufficient time for previewing lessons and helping teachers gain familiarity with lesson contents.

APPENDIX A

Brief Description of Chapter 1 Nonpublic School Reimbursable Services, 1988-89

Chapter 1 Nonpublic School Reimbursable programs provide supplementary, individualized instruction to students attending nonpublic schools in New York City. Students are eligible for Chapter 1 services if they live in targeted attendance area and score below a designated cutoff point on state-mandated standardized reading tests.

On July 1, 1985, the Supreme Court held that instruction by public school teachers on the premises of nonpublic schools--local educational agencies' most common method of serving Chapter 1-eligible children--was unconstitutional. As a result, alternative methods for providing Chapter 1 services to eligible nonpublic school students were devised. Students attending nonpublic schools now receive Chapter 1 services at mobile instruction units, public school sites, leased neutral sites, and nondenominational schools and via computer-assisted instruction in designated classrooms in nonpublic schools.

CORRECTIVE READING PROGRAM

The Corrective Reading program provides instruction in reading and writing. The goal is to enable students to reach grade level in reading. During 1988-89, the program served 7,943 students in grades kindergarten through twelve in 162 nonpublic schools. The total included 3,287 students receiving computer-assisted instruction and 4,656 students receiving face-to-face instruction. Program staff included a coordinator, three field supervisors, and 90 Corrective Reading teachers. Instruction was provided to small groups of students, one to five days per week, in sessions ranging from 30 to 60 minutes. Chapter 1 funding totaled $7.8 million.

READING SKILLS CENTER PROGRAM

The Reading Skills Center program provides instruction in reading and writing to students in grades four through eight. The goal is to enable students to reach grade level in reading. During 1988-89, the program served 176 students from four nonpublic schools. Program staff included a coordinator and seven teachers. Instruction was provided to small groups of about five students, three to five days per week, for sessions lasting from 45 to 60 minutes. Chapter 1 funding totaled $552,903.

CORRECTIVE MATHEMATICS PROGRAM

The Corrective Mathematics program provides instruction in mathematics. The goals are to deepen students' understanding of mathematical concepts and to improve their ability to perform computations and solve problems. During 1988-89, the program served 5,806 students attending 130 nonpublic schools. The total included 3,689 students receiving face-to-face instruction and 2,117 students receiving computer-assisted instruction. Program staff included a coordinator, two field supervisors, and 70 Corrective Mathematics program teachers. Instruction was provided to small groups of students, one to five days per week, in sessions ranging from 45 to 60 minutes. Chapter 1 funding totaled more than $5.3 million.

ENGLISH AS A SECOND LANGUAGE

The English as a Second Language program provides intensive English language instruction to limited English proficient students. The goal of the program is to help students gain the listening, speaking, reading, and writing skills necessary to improve their performance in school. During 1988-89, the program served 2,445 students in kindergarten through eighth grade in 69 nonpublic schools. Two thousand and twelve of these students received face-to-face instruction, and 433 of them computer-assisted instruction. In addition, a Read-Along component provided some students with tape recorders, storybooks, and audio tapes for home use. Program staff included a coordinator, two field supervisors, and 42 teachers. Instruction was provided to small groups of students, two to three days a week, in sessions ranging from 30 to 60 minutes. Chapter 1 funding totaled $2.7 million.

CLINICAL AND GUIDANCE PROGRAM

The Clinical and Guidance program provides diagnostic and counseling services to students enrolled in Chapter 1 nonpublic school programs--Corrective Reading, Reading Skills Center, Corrective Mathematics, and English as a Second Language. The goal of the program is to alleviate emotional or social problems that interfere with the students' ability to profit from remedial education. During 1988-89, the program served 5,707 students from 123 nonpublic schools. The staff included two coordinators, two field supervisors, 58 guidance counselors, 36 psychologists, one psychiatrist, and 12 social workers. Chapter 1 funding totaled $5.8 million.

OFFICE OF RESEARCH, EVALUATION, AND ASSESSMENT
INSTRUCTIONAL SUPPORT EVALUATION UNIT
E.C.I.A. - Chapter 1, NPS, C.A.I. 1988-89

TEACHER QUESTIONNAIRE

Computer Program _____ Subject (check one):
Corrective Mathematics____
Corrective Reading ____
ESL ____

I. Background Information
A. Teacher Experience
1. Years of Chapter 1 teaching experience_____
2. When did your very first C.A.I. class go online? Month _____
Year ____
3. Did you have previous C.A.I. experience (prior to the 1986-87 school year)?____Yes ____No
a) If yes, specify:_____

_____

4. Did you have previous experience with computers?____Yes____No
a) If yes, specify_____

_____

B. Students Served
1. Please check off/fill out whatever applies to you.

a)____CAI Only ____days per week _____ minutes per day

b)____Combination CAI:____days per week Face-to-____days per week
Services: ____minutes per day Face: ____minutes per day

c)____Non-C.A.I.,
Face-to-face only_____days per week _____minutes per day

2. Please list the number of C.A.I. students (including combination services)for whom you are responsible:

Grades: K____ 3____ 6____ 9____ 12____

1____ 4____ 7____ 10____
2____ 5____ 8____ 11____

3. Please list the number of non-C.A.I., face-to-face only students for whom you are responsible:

Grades: K____ 3____ 6____ 9____ 12____
1____ 4____ 7____ 10____

2____ 5____ 8____ 11____

4. How many schools do you work with in each of the following categories: C.A.I. only _____
   Combination services_____
   Face-to-face only_____

II Communication with C.A.I. Schools

A. Communication with NPS Principals and classroom teachers

What C.A.I. reports do you provide, and how often do you provide them, to principals and classroom teachers?

Reports	Provided to:	How Often?
_____	_____	_____
_____	_____	_____
_____	_____	_____

B. Communication with Non-Instructional Technicians

1. With how many Non-instructional technicians do you work?_____

2. How often do you speak to them?_____

3. Describe the purpose, (purposes) of a typical communication(s):

_____

_____

_____

_____

C. Communication with Students

1. What percentage of your communications with students are:

By Telephone _____%
By Computer Mail _____%
Face-to-Face _____%

100%

2. On the average, with how many students do you communicate each week? _____

D. How can your communication with students and non-instructional technicians at C.A.I. sites be improved?_____

_____

_____

_____

III Perceptions of Software

A. Usefulness of reports

1. Are software-generated reports adequate for tracking student progress? _____Yes ____No

a) Is there any information about student progress which you would like added to the reports? _____

_____

_____

2. Are principals satisfied with the reports?____Yes ____ No

a) What is the most frequently asked question from a principal about a report? _____

_____

_____

B. Lesson Contents

1. Approximately what percentage of the C.A.I. lessons covered by your students have you had a chance to preview?_____

a) Approximately what percentage of your time do you use for previewing lessons?_____

2. Please rate the following software features:

	Excellent	Good	Fair	Poor
a) Factual accuracy	____	___	___	___
b) Appropriateness of lessons to program's educational objectives	____	___	___	___
c) Correlation of lesson contents with subject area's curriculum objectives	____	___	___	___
d) A developmentally logical approach to the sequencing of material	____	___	___	___
e) Explanations provided as a result of errors	____	___	___	___
f) Maintains student interest and motivation	____	___	___	___
g) Explanation of concepts				

and principles	____	___	___	___
h) Enchances problem solving and critical thinking ability	____	___	___	___
i) Graphics component	____	___	___	___
j) Audio component	____	___	___	___
k) Pacing of lessons	____	___	___	___
l) Reinforcement of concepts and skills	____	___	___	___
m) Reviews of lesson content	____	___	___	___

3. Does the software provide an initial placement test?___Yes___No
   a) If yes, have you used it?____Yes ____No
   b) If no, how did you place your students in the software curriculum? _____

_____

_____

_____

4. How often, on the average, do you have to adjust the difficulty level of the software? _____ Weekly
   _____ Bi-Monthly
   _____ Monthly
   _____ Less Often

5. How responsive is the software company to your requests and suggestions?
   ____Very ____Moderately ____Somewhat ____Not at all

6. What suggestions do you have for the improvement of lesson contents?

_____

_____

_____

_____

_____

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_____

_____

_____

_____

IV. Combination Services Information

A. How do you utilize your face-to-face instructional time?

B. How do your C.A.I. teaching techniques and curriculum content differ from non C.A.I.?

C. Describe the quality and frequency of the feedback you receive regarding your students' computer-based learning.

END

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